# Wind Workshop for State Lands

Ed Cannon
National Renewable Energy Laboratory

# Fastest-Growing Energy Source

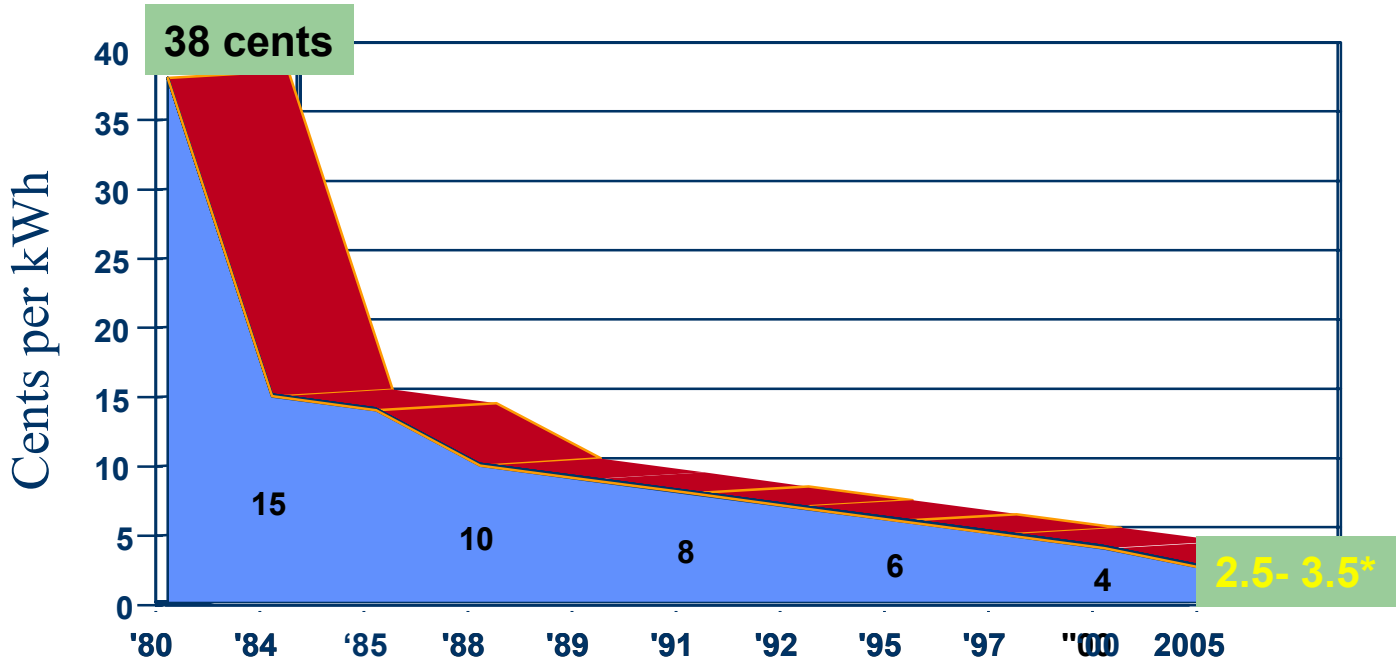
- Wind is the fastest growing energy source worldwide, increasing 37% in past year.
- 67% in U.S.
- Wind electricity prices competitive with most fuels
- Wind energy is growing faster than the personal computer market and as fast as the cell phone market.

# Wind Energy Market

- Expand from 0.32% of world electricity generation to 2% by 2011 (shorter term forecast)
- 180,000 installed MW by 2011, or ~20,000 MW/yr
- If growth is ~10% after 2011, 522,000 MW by 2020 or 4.6% of world electricity generation (without reference to renewable production of fuels)

# Wind Energy Cost

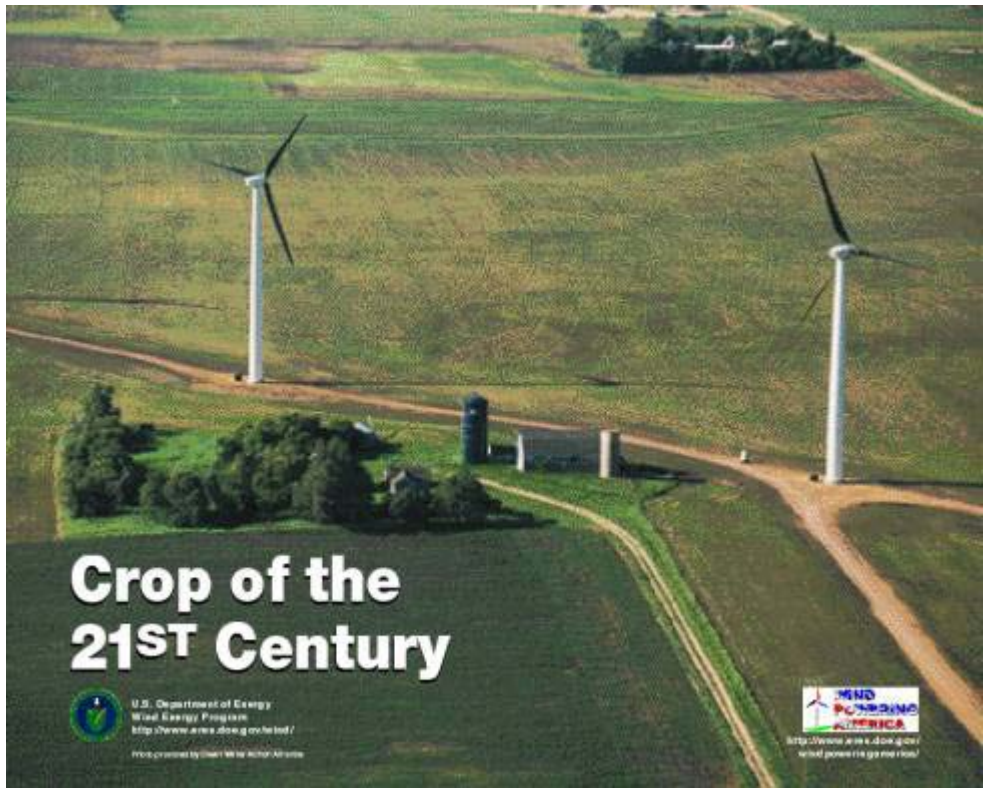
## Cost of Wind-Generated Electricity 1980 to 2005, Levelized cents/kWh



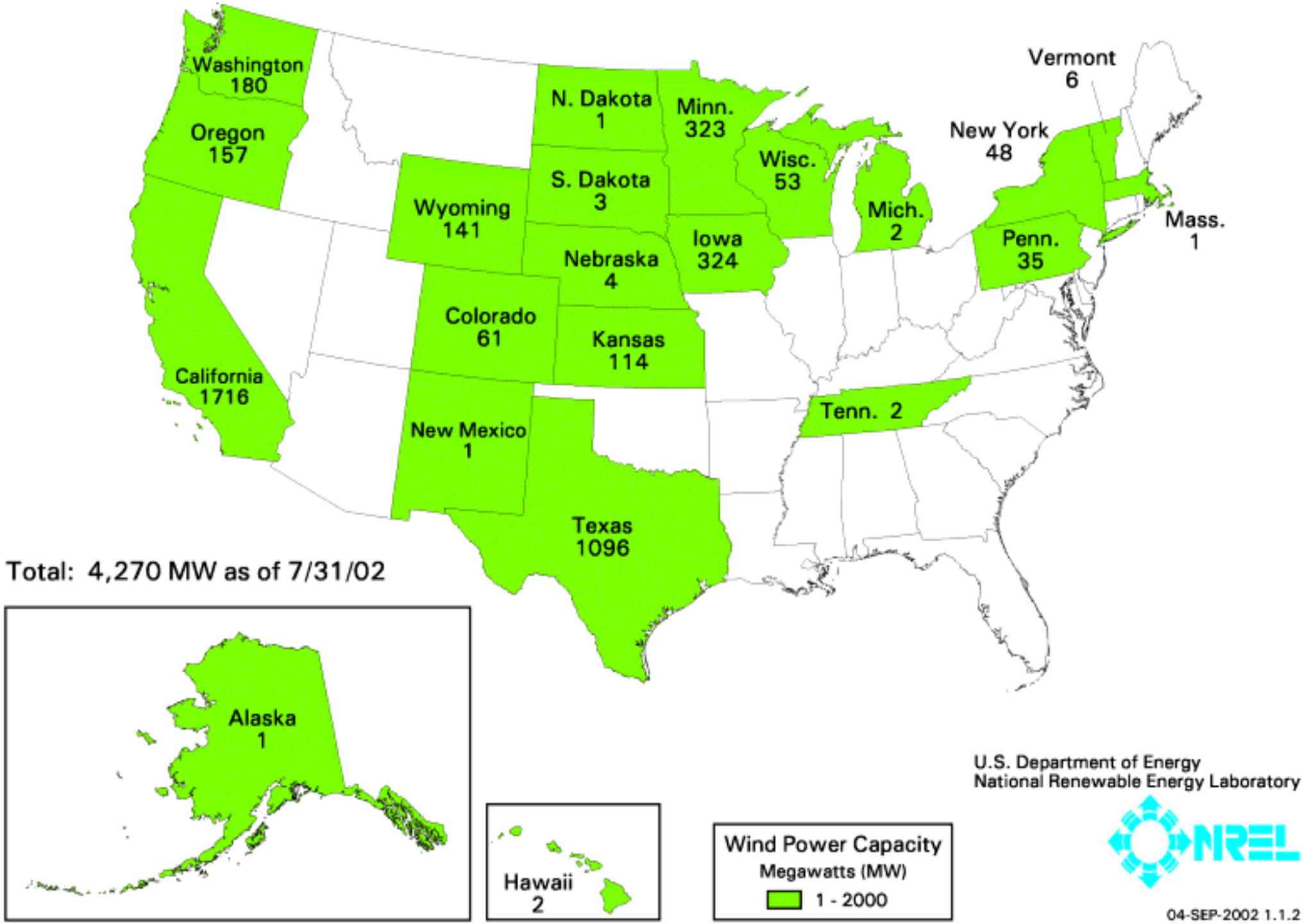

Assumptions: Levelized cost at "excellent" wind sites, large project size, not including PTC (post 1994), costs in nominal cents/kWh.

# U.S. Wind Market Drivers

- Declining wind costs
- Fuel Price Uncertainty
- Federal and State Policies
- Economic Development
- Green Power
- Energy Security



# United States - 2002 Wind Capacity (MW)




Total: 4,270 MW as of 7/31/02

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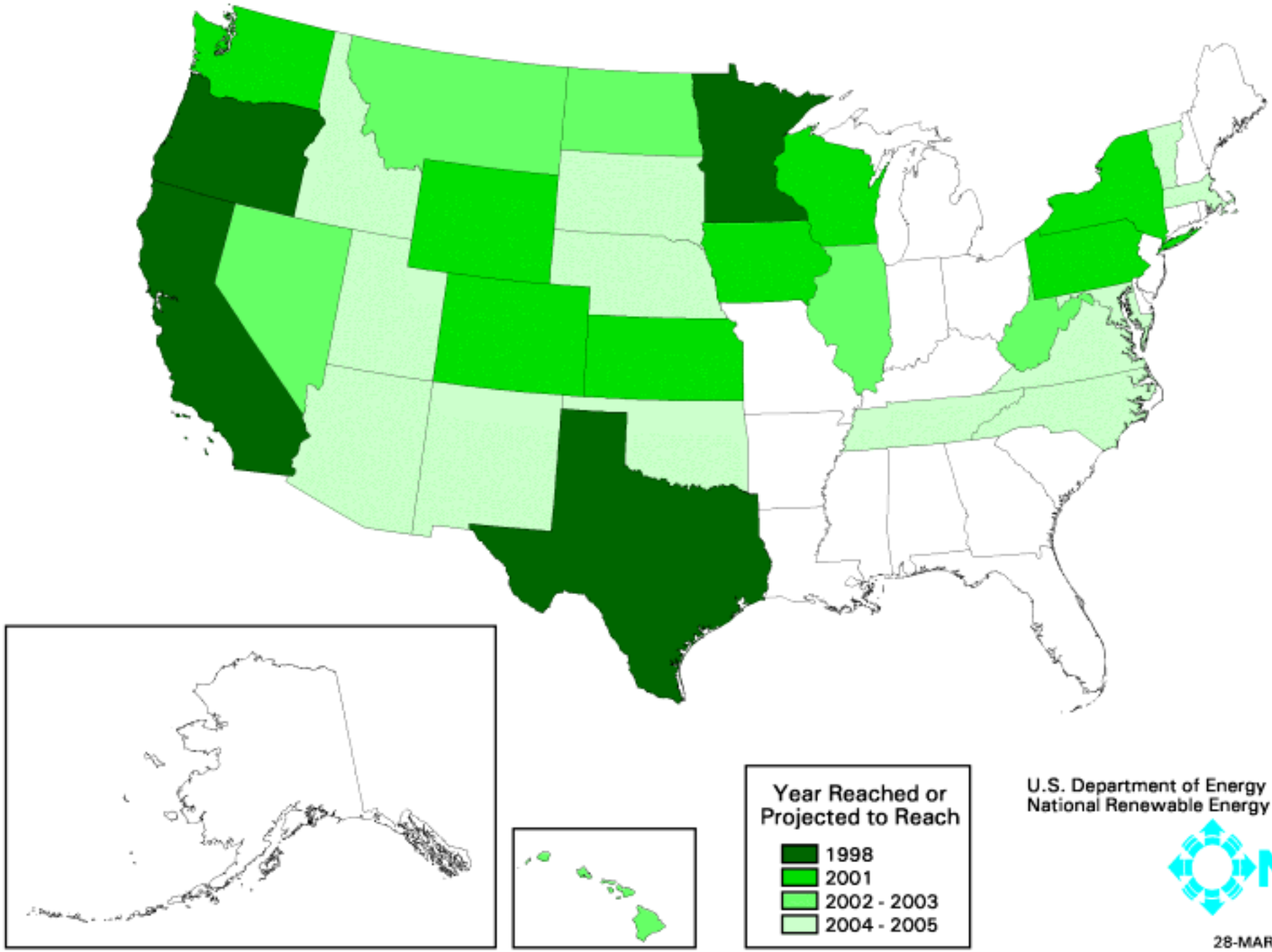
# United States - States with at Least 20 MW of Installed Capacity by 2005

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# Wind Power Not a New Idea

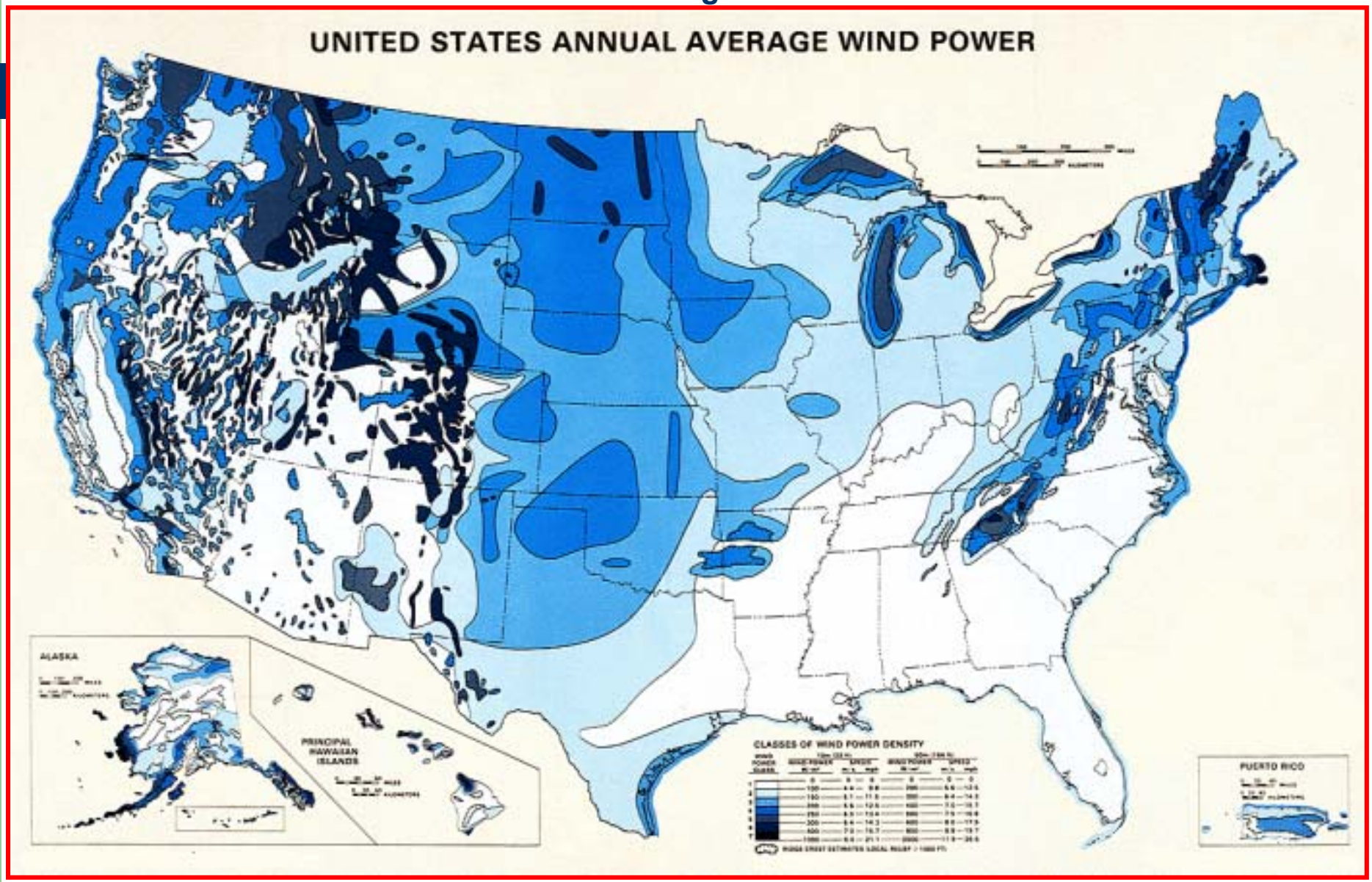
# In Use Since Ancient Times

# Wind Energy is Solar Energy

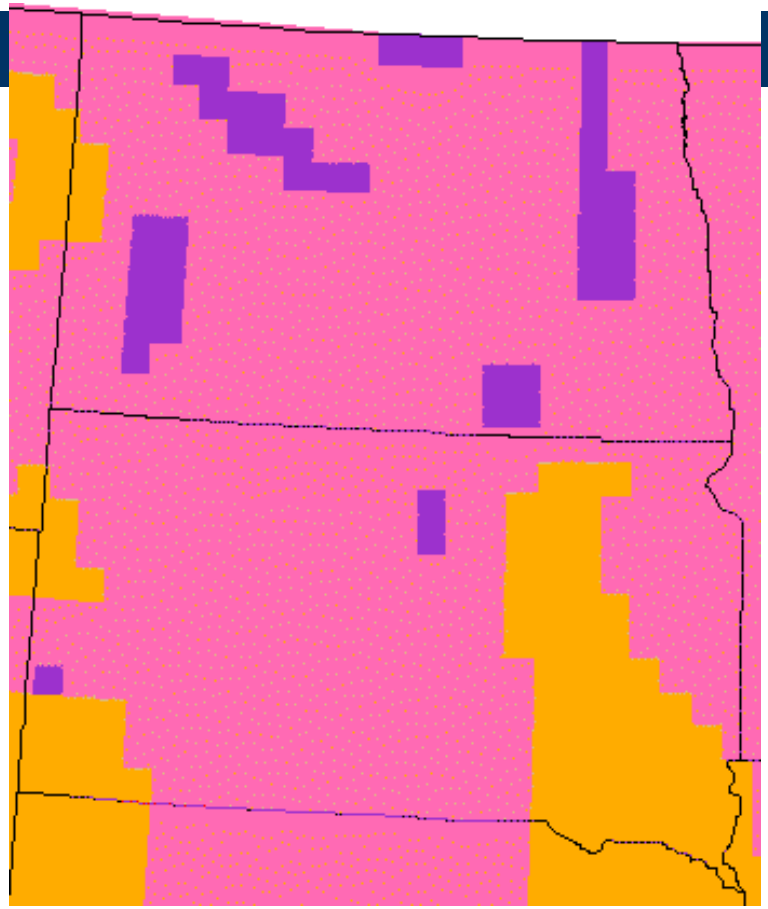
- Wind energy is created by uneven solar heating.
- Wind energy is kinetic energy--mass and momentum. $P = A \bullet \rho V^3/2$
- Wind energy is proportional to velocity cubed ($V^3$):
  - If velocity is doubled, power increases by a factor of eight ($2^3 = 8$).
  - Small differences in average speed cause big differences in energy production.

# Average Annual Wind Resource

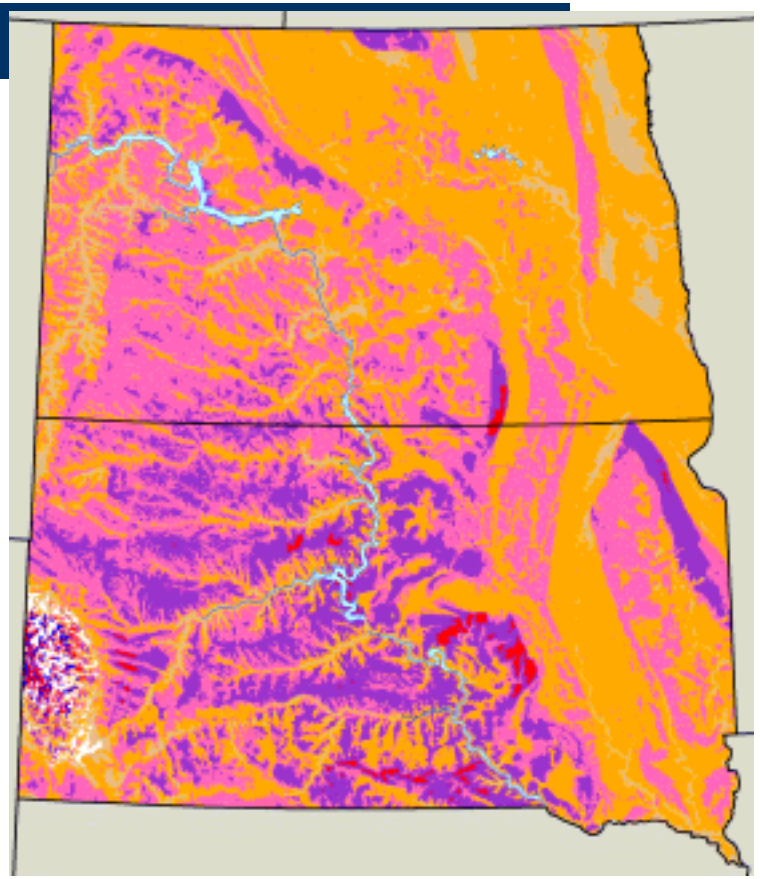
**Darker shades indicate higher wind resource**



# New Detailed Maps Being Created



1987



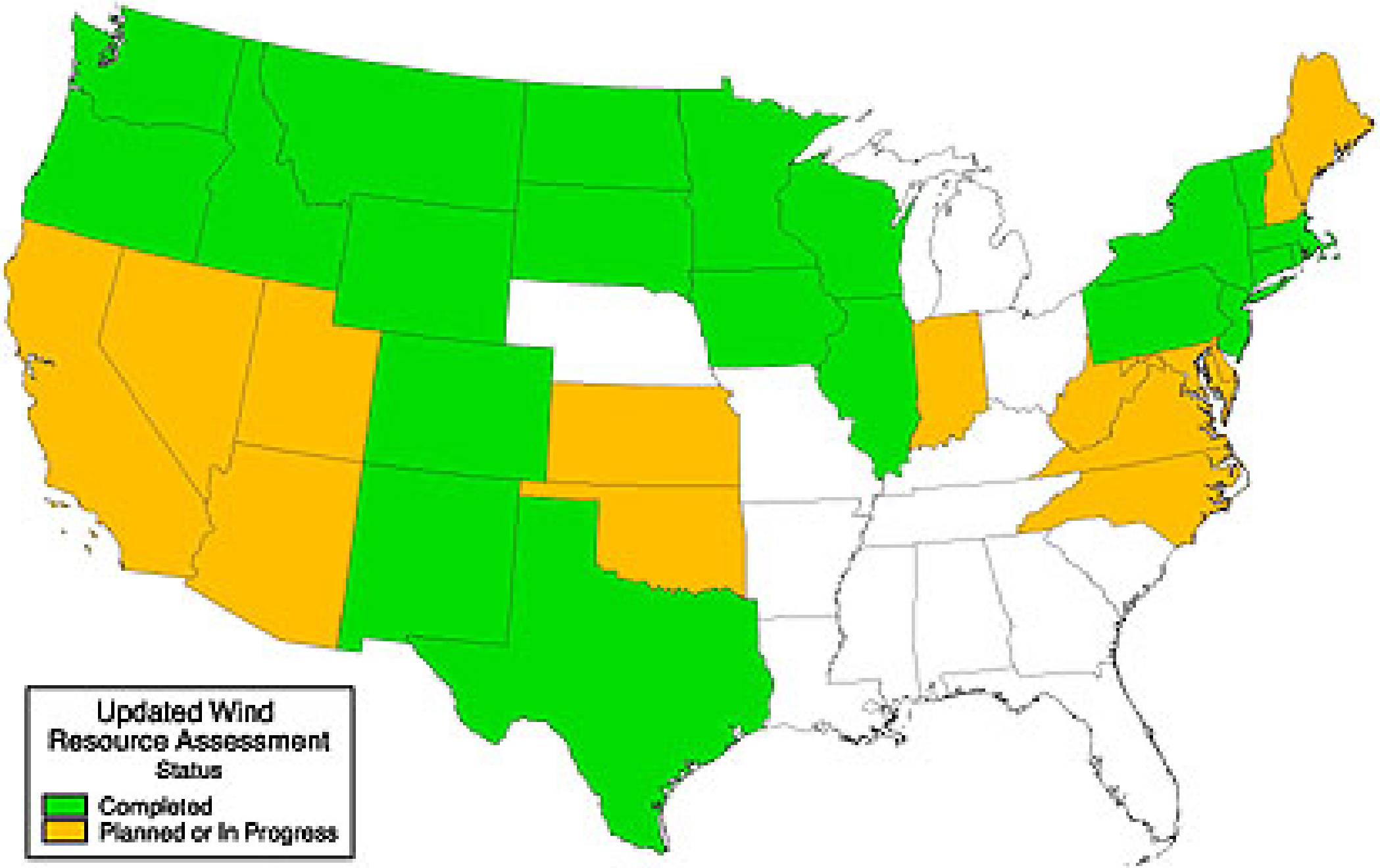
2000

Wind Power Classification

| Wind Power Class | Resource Potential | Wind Power Density at 50 m W/m² | Wind Speed* at 50 m m/s | Wind Speed* at 50 m mph |
|---|---|---|---|---|
| 2 | Marginal | 200 - 300 | 5.6 - 6.4 | 12.5 - 14.3 |
| 3 | Fair | 300 - 400 | 6.4 - 7.0 | 14.3 - 15.7 |
| 4 | Good | 400 - 500 | 7.0 - 7.5 | 15.7 - 16.8 |
| 5 | Excellent | 500 - 600 | 7.5 - 8.0 | 16.8 - 17.9 |
| 6 | Outstanding | 600 - 800 | 8.0 - 8.8 | 17.9 - 19.7 |
| 7 | Superb | 800 - 1600 | 8.8 - 11.1 | 19.7 - 24.8 |

*Wind speeds are based on a Weibull k value of 2.0

# United States - Updated Wind Resource Assessment Status



# Federal Wind Studies

- Bureau of Land Management, Forest Service, Native American Lands
  - Secretary of the Interior Norton directed that process be streamlined
  - BLM screened all planning areas to identify those with highest RE potential
  - Accelerating revised land use plans
  - Training local offices on renewable energy
  - Seeking showcase projects for quick success

# Federal Wind Studies (cont.)

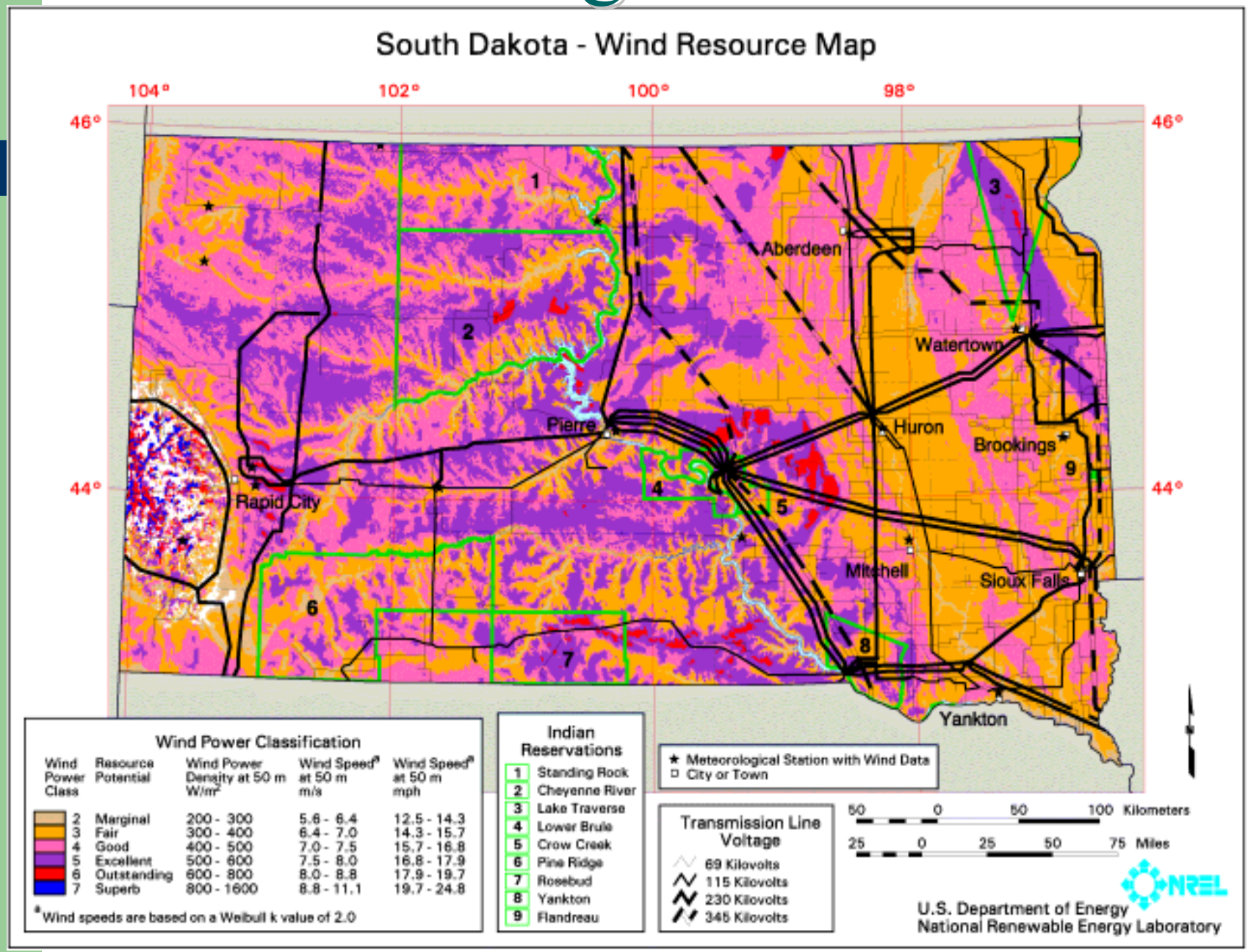
- Department of Defense
  - 2002 Military Construction appropriation contained $6 million set aside
  - Screen all CONUS bases for renewable energy projects on or near military bases
  - Air Force lead
    - Air Force -- Wind
    - Army -- Solar
    - Navy -- Geothermal

# Anemometer Loan Program

Installation at F. E. Warren AFB, WY

- For initial surveys
- 10 anemometers
- 20 meter poles
- Installation kit
- Pull data chips monthly and sent to NWTC for analysis
- Contact Ed Cannon or Tony Jimenez at NWTC 303-384-6900

# Wind Resource Must Be in "Right Place"



# Market Barriers

- Siting Issues
  - Avian
  - Noise
  - Aesthetics
- Transmission
- Intermittence

# Summary of NREL Help Available

- Preliminary and detailed wind analysis
- Anemometer loans
- Potential of lands for wind development
- Input to wind, RE, and permit policy
- Review of permit applications
- Technical expertise and advice

# WIND POWERING AMERICA



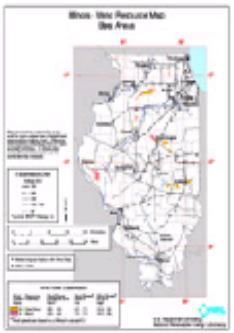
## WPA Highlights

* *Global Windpower 2002 WPA Presentation (PDF 2.5 MB)* *Download Acrobat Reader*
* *Great River Energy Wins National Recognition for Wind Power Program*
* *March Stakeholder Interview*
* *Wind Energy Development for Communities of Color*
* *Wind Power Update (PDF 3.3 MB)* *Download Acrobat Reader*
* *Funding Opportunity Renewable Energy Development on Tribal Lands*

Wind Powering America is a commitment to dramatically increase the use of wind energy in the United States. This initiative will establish new sources of income for American farmers, Native Americans, and other rural landowners, and meet the growing demand for clean sources of electricity.

Through Wind Powering America, the United States will achieve targeted regional economic development, protect the local environment, reduce air pollution, lessen the risks of global climate change, and increase energy security.

While visiting the Wind Powering America Web site you can find state wind maps, small wind consumer's guides, wind workshops that are going on in your area, and much more. Visit the "Regional Activities" section above to read news articles, press releases, and fact sheets for the area of your interest.



*Business Information*
*Wind Turbine Photos*

| Calendar | | | | | | |
|---|---|---|---|---|---|---|
| S | M | T | W | T | F | S |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |

www.eren.doe.gov/windpoweringamerica

Send your comments to the Webmaster.